

MOISTURE BARRIER FILM COATING COMPOSITION, METHOD, AND COATED FORM

Patent Number: WO9601874
Publication date: 1996-01-25
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Requested Patent: WO9601874
Application Number: WO1995US08690 19950712
Priority Number (s): GB19940014045 19940712; US19950466939 19950606.
IPC Classification: C08L89/00; C08L5/04; C08L1/26; C08K5/15; C08K3/34; A61K9/28; A61K9/30; A61K9/42; A61K9/34; A61K9/36
EC Classification: A61K9/28H4, A61K9/28H6B, C09D129/04
Equivalents: AU3006795, AU703933, CN1097619B, CN1157002, CZ9700085, EP0771339 (WO9601874), A4, HU78071, JP2002515074T
Cited Documents: US5393333; US5411746; US4341563; US5206030

Abstract

A dry moisture barrier film coating composition for forming a moisture barrier film coating for pharmaceutical tablets and the like comprises polyvinyl alcohol, soya lecithin, and optionally a flow aid, a colorant, and/or a suspending agent. A liquid coating solution or dispersion for forming a moisture barrier film coating for pharmaceutical tablets and the like comprises polyvinyl alcohol, soya lecithin, water, and optionally a flow aid, a colorant, and/or a suspending agent. A method of coating pharmaceutical tablets and the like with a moisture barrier film coating comprises forming a liquid coating solution or dispersion for forming a moisture barrier film coating for pharmaceutical tablets and the like comprising polyvinyl alcohol, soya lecithin, water, and optionally a flow aid, a colorant, and/or a suspending agent, applying the coating solution or dispersion onto the tablets to form a film coating on the tablets, and drying the film coating on the tablets.

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C08L 89/00, 5/04, 1/26, C08K 5/15, 3/34, A61K 9/28, 9/30, 9/42, 9/34, 9/36		A1	(11) International Publication Number: WO 96/01874
			(43) International Publication Date: 25 January 1996 (25.01.96)
(21) International Application Number: PCT/US95/08690		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).	
(22) International Filing Date: 12 July 1995 (12.07.95)			
(30) Priority Data: 9414045.6 12 July 1994 (12.07.94) GB 08/466,939 6 June 1995 (06.06.95) US			
(60) Parent Application or Grant (63) Related by Continuation US 08/466,939 (CON) Filed on 6 June 1995 (06.06.95)		Published With international search report.	
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(54) Title: MOISTURE BARRIER FILM COATING COMPOSITION, METHOD, AND COATED FORM			
(57) Abstract A dry moisture barrier film coating composition for forming a moisture barrier film coating for pharmaceutical tablets and the like comprises polyvinyl alcohol, soya lecithin, and optionally a flow aid, a colorant, and/or a suspending agent. A liquid coating solution or dispersion for forming a moisture barrier film coating for pharmaceutical tablets and the like comprises polyvinyl alcohol, soya lecithin, water, and optionally a flow aid, a colorant, and/or a suspending agent. A method of coating pharmaceutical tablets and the like with a moisture barrier film coating comprises forming a liquid coating solution or dispersion for forming a moisture barrier film coating for pharmaceutical tablets and the like comprising polyvinyl alcohol, soya lecithin, water, and optionally a flow aid, a colorant, and/or a suspending agent, applying the coating solution or dispersion onto the tablets to form a film coating on the tablets, and drying the film coating on the tablets.			

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**MOISTURE BARRIER FILM COATING COMPOSITION, METHOD,
AND COATED FORM**

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 This invention is in the field of coating of
substrates like pharmaceutical tablets, and it is
specifically concerned with coating such substrates
with a coating that acts as a moisture barrier.

2. Description of the Prior Art

10 Many medicinal substances and the dosage forms
into which they are made undergo degradation during
storage due to contact with moisture which has been
absorbed from the atmosphere. To combat this
degradation, it is frequently necessary for such
15 moisture sensitive dosage forms to be packed in
special containers to limit the exposure of the
dosage forms to the atmosphere.

In territories where the climate is very humid, specialized packaging does not provide a totally satisfactory answer to moisture degradation.

5 Elimination of the need for the special packaging, or augmentation of the moisture protection provided by such packaging, may be achieved in the case of solid dosage forms, such as tablets, capsules and granules, by coating with materials which reduce the rate at which the dosage
10 form absorbs atmospheric moisture. Moisture barrier coatings of this type have been employed previously. The traditional means of providing the moisture barrier characteristics required for moisture barrier coatings has been by the use of polymers
15 which are soluble in organic solvents or are relatively insoluble in water. The disadvantages of this approach are 1) the need to use either organic solvents or difficult aqueous polymer dispersion techniques to apply these water-insoluble
20 polymer materials, and 2) the reduced aqueous solubility of the coating leading to prolonged disintegration time of the dosage form in the body when ingested, with consequent delayed or reduced activity of the medicinal substance in the tablet.

The use of the polymer polyvinyl alcohol, PVA, as a moisture barrier coating has been previously suggested. However, practical usage has been inhibited by the stickiness of grades of the polymer which have a fast enough rate of going into solution in water to make a dispersion to render them economical to use in making the coating. A further problem with the use of PVA is in identifying or selecting a plasticizer which does not compromise the moisture barrier properties of the final coating.

SUMMARY OF THE INVENTION

A dry powder moisture barrier coating composition is made to form a moisture barrier film coating for pharmaceutical tablets and the like, which comprises polyvinyl alcohol in combination with soya lecithin, together with, none, one or more of the following components which enhances the desirable coating characteristics of the resulting film coating: a flow aid, a colorant, and a suspending agent.

A method of making the moisture barrier film coating powder composition of the invention comprises the steps of mixing polyvinyl alcohol with soya lecithin and optionally with one or more of the

following components, until a dry homogenous powder mixture is produced: a flow aid, a colorant, and a suspending agent. Preferably, the mixture of polyvinyl alcohol and soya lecithin, or the mixture of polyvinyl alcohol and soya lecithin and any of the following components, if any of the following components is to be included in the coating composition, is milled: a flow aid, a colorant, and a suspending agent. The resulting dry powder coating composition is readily soluble or dispersible in cold water to form a liquid coating solution or dispersion that is ready to use within 45 minutes.

Another method of making a dry edible film coating composition of the invention comprises producing a mixture of the ingredients processed into a granular form to form a granular coating composition by using any of the following methods: wet massing, fluid bed granulation, spray granulation and dry compaction, roller compaction or slugging.

The invention also includes a liquid coating solution or dispersion for forming a moisture barrier film coating which comprises polyvinyl alcohol, soya lecithin, an optional flow aid, an optional colorant, and an optional suspending agent.

mixed into water.

The method of making the liquid coating dispersion of the invention comprises dispersing the dry powder coating composition, the granular coating composition, or the individual ingredients of the coating composition separately, into hot or cold water, and/or milling and/or stirring until a homogenous mixture of a desired correct viscosity is produced.

The film former of the coating is the polyvinyl alcohol, which may be GOHSENOL polyvinyl alcohol made by NIPPON GOHSEI, for example.

Excellent moisture barrier properties are obtained when hot water soluble grades of PVA are used in the inventive coating, but use of such grades requires that the water of the liquid coating dispersion be heated. The coatings of the invention may use cold water soluble grades of PVA to provide moisture barrier protection, but they provide less moisture barrier protection than that provided by the inventive coatings that use hot water soluble grades of PVA. A preferred grade of PVA for use in the inventive coating is a grade in the medium range (i.e., the grades of PVA between the grades that dissolve only in hot water and the grades that dissolve very easily in cold water) of PVA because the step

of heating the water of the liquid coating dispersion may not be necessary, while still maintaining excellent moisture barrier properties in the inventive coating.

5 The flow aid may be talc, fumed silica, lactose or starch.

 The colorant may be any food approved colors, opacifiers, or dyes. For example, these may be aluminum lakes, iron oxides, titanium dioxide, or
10 natural colors.

 The soya lecithin, which may be ALCOLEC soya lecithin made by American Lecithin Company, for example, acts as an anti-tack agent, and surprisingly, and unexpectedly, acts as a
15 plasticizer by locking moisture in the coating so the coating stays flexible and not brittle. Surprisingly and unexpectedly, this locked-in moisture in the coating, while contributing to plasticization, does not compromise the moisture
20 barrier properties of the overall coating.

 The suspending agent acts as a viscosity modifier stabilizing the coating dispersion. A preferred suspending agent is xanthan gum. Examples of alternative suitable suspending agents include
25 hydroxypropylmethyl cellulose (HPMC), alginates, hydroxypropyl cellulose (HPC), natural gums, and

carboxymethylcellulose.

The ranges for each component of the dry coating compositions of the invention are as follows, by weight:

5		<u>Acceptable Ranges</u>	<u>Preferred Ranges</u>
	Polyvinyl Alcohol	20.0% to 99.8%	30 to 99.0%
	Flow Aid	0.0% to 40.0%	14.0 to 25.0%
	Colorant	0.0% to 60.0%	25.0 to 40.0%
10	Soya Lecithin	0.2% to 10.0%	1.0 to 6.0%
	Suspending Agent	0.0% to 2.0%	0.15 to 1.0%

The ranges for each component of the liquid coating dispersions of the invention are as follows, by weight:

	<u>Acceptable Ranges</u>	<u>Preferred Ranges</u>
5 Polyvinyl Alcohol	5.0 to 40.0%	7.0 to 12.0%
Flow Aid	0.0 to 16.0%	3.0 to 5.0%
Colorant	0.0 to 24.0%	4.8 to 8.0%
Soya Lecithin	0.04 to 4.0%	0.3 to 0.5%
Suspending Agent	0.0 to 0.8%	0.07 to 0.12%
10 Water	60.0 to 95.0%	75.0 to 85.0%

DETAILED DESCRIPTION

We now turn to the examples of the invention, all ingredients being by weight.

EXAMPLE 1

15 455.2 grams of polyvinyl alcohol, 200.0 grams of talc, 320.0 grams of titanium dioxide, 4.8 grams of xanthan gum, and 20.0 grams of soya lecithin are loaded into a dry powder mill, such as a PK blender, and vigorously mixed therein for 25 minutes or until
20 a homogenous mix is achieved, resulting in one formulation of the inventive dry powder moisture barrier film coating composition.

480 grams of this formulation of the inventive dry powder moisture barrier film coating composition is dispersed in 1701.8 grams of purified water to form an aqueous suspension of the invention.

5 Specifically, 1701.8 grams of purified water at ambient temperature is loaded into a vessel having a diameter that is approximately equal to the depth of the final suspension. A low shear mixer, preferably having a mixing head that has a diameter that is
10 approximately 1/3 the diameter of the mixing vessel, is lowered into the water and turned on to create a vortex from the edge of the vessel down to just above the mixing head without any air being drawn into the water. Then, the 480.0 grams of the
15 moisture barrier film coating powder composition is added to the vortex at a rate where there is no excessive build up of dry powder. The speed or depth of the mixing head is adjusted to avoid air being drawn into the suspension so as to avoid
20 foaming. The suspension is stirred for 45 minutes and is then ready for spraying onto substrates like pharmaceutical tablets.

In this Example 1, 10 Kg of tablets are coated with the coating of the invention so as to obtain
25 about a 4.0% weight gain. Th xtra 80 grams of the dry powder moisture barrier film coating composition

above the 400 grams of the dry powder moisture barrier film coating composition needed to obtain a 4.0% weight gain on the tablets is included to allow for losses of coating composition during the coating procedure. 10 Kg of tablets which have logos embossed therein are loaded into a Manesty Model 10 Accela-Cota coater, and the tablets are rotated in the coater at a rotation speed of 12 rpm. The tablets are sprayed with the coating suspension of this Example 1 while the tablets are being rotated. Hot air at 60°C is used to evaporate the water in sprayed coating suspension and to maintain the tablets at 38°C.

Upon completion of the coating process, the tablets show a smooth surface with excellent logo definition.

In the following Examples 2 to 14, one Kg batches of coating suspension are produced by mixing 220 grams of inventive dry powder moisture barrier coating composition into 780 grams of purified water. These coating suspensions are then sprayed onto tablets. The procedures set out in Example 1 for making the dry powder moisture barrier coating composition, for making the coating suspension, and for spraying the coating suspension onto tablets are used in Examples 2 to 14. The coated tablets of th

Examples 2 to 14 show a smooth surface with excellent logo definition.

EXAMPLE 2

5	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	45.85	458.50
	TALC	20.00	200.00
	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	0.15	1.50
	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

EXAMPLE 3

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	44.80	448.00
	TALC	20.00	200.00
5	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	1.20	12.00
	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

EXAMPLE 4

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
10	PVA	46.52	465.20
	TALC	20.00	200.00
	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	0.48	4.80
15	SOYA LECITHIN	<u>1.00</u>	<u>10.00</u>
		100.00	1000.00

EXAMPLE 5

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	41.52	415.20
20	TALC	20.00	200.00
	TITANIUM DIOXIDE	18.00	180.00
	YELLOW IRON OXIDE	14.00	140.00
	XANTHAN GUM	0.48	4.80
	SOYA LECITHIN	<u>6.00</u>	<u>60.00</u>
25		100.00	1000.00

EXAMPLE 6

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	31.64	316.40
	TALC	34.09	340.90
5	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	1.13	11.30
	SOYA LECITHIN	<u>1.14</u>	<u>11.40</u>
		100.00	1000.00

EXAMPLE 7

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
10	PVA	50.40	504.00
	TALC	14.40	144.00
	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	1.20	10.00
15	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

15

EXAMPLE 8

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	99.00	990.00
	SOYA LECITHIN	<u>1.00</u>	<u>10.00</u>
5		100.00	1000.00

EXAMPLE 9

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	99.80	998.00
	SOYA LECITHIN	<u>0.20</u>	<u>2.00</u>
10		100.00	1000.00

EXAMPLE 10

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	44.00	440.00
	TALC	20.00	200.00
15	TITANIUM DIOXIDE	18.00	180.00
	TARTRAZINE ALUMINUM		
	LAKE	14.00	140.00
	XANTHAN GUM	2.00	20.00
	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
20		100.00	1000.00

EXAMPLE 11

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	50.80	508.00
	TALC	14.00	140.00
5	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	1.20	12.00
	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

EXAMPLE 12

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
10	PVA	40.52	405.20
	TALC	25.00	250.00
	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	0.48	4.80
15	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

EXAMPLE 13

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	25.52	255.20
20	TALC	40.00	400.00
	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	0.48	4.80
	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

EXAMPLE 14

	<u>COMPONENT</u>	<u>PERCENTAGE</u>	<u>GRAMS</u>
	PVA	45.52	455.20
	TALC	20.00	200.00
5	TITANIUM DIOXIDE	32.00	320.00
	XANTHAN GUM	0.48	4.80
	SOYA LECITHIN	<u>2.00</u>	<u>20.00</u>
		100.00	1000.00

EXAMPLE 15

10 A preferred formulation of the inventive
coating dispersion is as follows:

	<u>COMPONENT</u>	<u>GRAMS</u>
	WATER	1170.00
	PVA	150.00
15	TALC	66.00
	TITANIUM DIOXIDE	105.75
	XANTHAN GUM	1.65
	SOYA LECITHIN	<u>6.60</u>
		1500.00

20 The coating dispersion of this Example 15 is made
and used using the procedures set out in Example 1.

 It was unexpectedly found that soya lecithin,
included for its tack r ducti n properties, acts as
a plasticizer by locking moisture in the coating so
25 as to keep the coating fl xibl and not brittle. It

is also considered unexpected that this moisture while contributing to plasticization, does not compromise the moisture barrier properties of the overall coating.

5 This invention provides the means of preparing a moisture barrier coating for application to pharmaceutical solid dosage forms in which the coating composition material is presented as a dry particle powder or granular powder which is readily
10 dispersible in cold water. The resultant coating solution or dispersion is ready to use by applying it to tablets within 45 minutes. The coating solution or dispersion may also be presented in the form of a ready-to-use liquid, or liquid concentrate
15 which is diluted prior to use.

 Compared with existing moisture barrier coatings using water insoluble polymers, there is negligible effect on the disintegration time of the coated dosage forms coated with the inventive
20 coating.

 The dry form of the invention is manufactured using rotary mixers or mills. The ingredients are loaded and then milled until a homogenous mix is produced. In the case of liquid dispersions, the
25 ingredients are dispersed into hot or cold water and stirred or milled until a homogenous dispersion or

solution of the desired correct viscosity is produced.

The dry form of the invention, which comprises a powder of PVA and soya lecithin, and optionally a flow aid, a colorant, and a suspending agent, is dispersed in water and stirred until the PVA is hydrated and a homogenous mixture is produced. The liquid solution or dispersion formed, which comprises PVA, soya lecithin, and any optional components mixed into water, may be ready-to-use or require simple dilution with water prior to use. The resulting coating dispersion is sprayed onto the dosage forms using airless or airborne methods. The movement of air around or through the tablet bed facilitates drying of the film on the tablet surface.

Claims:

1. A dry moisture barrier film coating composition for forming a moisture barrier film coating for pharmaceutical tablets and the like comprising

polyvinyl alcohol, and
soya lecithin.

2. The coating composition of claim 1, further including

a flow aid.

3. The coating composition of claim 1, further including

a colorant.

4. The coating composition of claim 1, further including

a viscosity modifier for stabilizing the coating dispersion.

5. The coating composition of claim 1, the polyvinyl alcohol being in a range of about 20.0% to about 99.8% by weight of the composition, and

the soya lecithin being in a range of about
0.2% to about 10.0% by weight of the composition.

6. The coating composition of claim 1,
the polyvinyl alcohol being in a range of about
5 30.0% to about 99.0% by weight of the composition,
and

the soya lecithin being in a range of about
1.0% to about 6.0% by weight of the composition.

7. The composition of claim 2,
10 the flow aid being in a range of greater than
0.0% to about 40.0% by weight of the composition.

8. The composition of claim 2,
the flow aid being in a range of about
14.0% to about 25.0% by weight of the composition.

9. The coating composition of claim 2,
15 the flow aid being talc, fumed silica, lactose,
or starch.

10. The coating composition of claim 3,
the colorant being in a range of greater than
20 0.0% to about 60.0% by weight of the composition.

11. The coating composition of claim 3,
the colorant being in a range of about 25.0% to
about 40.0% by weight of the composition.

5 12. The coating composition of claim 3,
the colorant any food approved colors,
opacifiers or dyes.

10 13. The coating composition of claim 4,
the viscosity modifier being in a range of
greater than 0.0% to about 2.0% by weight of the
composition.

14. The coating composition of claim 4,
the viscosity modifier being in a range of
about 0.15% to about 1.0% by weight of the
composition.

15 15. The coating composition of claim 4,
the viscosity modifier being a xanthan gum.

16. The coating composition of claim 4,
the viscosity modifier being hydroxypropyl-
methylcellulose, alginate, hydroxypropyl cellulose,
20 natural gums, carboxymethylcellulose, or
combinations thereof.

17. The coating composition of claim 1,
the polyvinyl alcohol being in a range of about
30.0% to about 99.0% by weight of the composition,
the soya lecithin being in a range of about
5 1.0% to about 6.0% by weight of the composition, and
further including
a flow aid,
the flow aid being in a range of about 14% to
about 25% by weight of the composition,
10 the flow aid being talc, fumed silica, lactose,
or starch,
a colorant,
the colorant being in a range of about 25.0% to
about 40.0% by weight of the composition,
15 the colorant being any food approved colors,
opacifiers, or dyes,
a viscosity modifier for stabilizing the
coating dispersion,
the viscosity modifier being in a range of
20 about 0.15% to about 1.0% by weight of the
composition,
the viscosity modifier being xanthan gum,
hydroxypropyl-methylcellulose, alginates,
hydroxypropyl cellulose, natural gums,
25 carboxymethylcellulos , or combinations thereof.

18. A method of coating substrates such as pharmaceutical tablets and the like with a moisture barrier film coating, comprising

5 mixing the coating composition according to any of the claims 1-17 into water to form an aqueous coating solution/dispersion,

applying the coating solution/suspension onto the substrates to form a film coating on the substrates, and

10 drying the film coating on said substrates.

19. A liquid moisture barrier coating composition for coating substrates such as pharmaceutical tablets and the like, comprising

15 the coating composition of any of the claims 1-17, and water.

20. A liquid moisture barrier film coating composition for forming a moisture barrier film coating for pharmaceutical tablets and the like comprising

20 polyvinyl alcohol,
soya lecithin, and
water.

21. The liquid composition of claim 20,
further including
a flow aid.

22. The liquid composition of claim 20,
further including
a colorant.

23. The liquid composition of claim 20,
further including
a viscosity modifier for stabilizing the
coating dispersion.

24. The liquid composition of claim 20,
the polyvinyl alcohol being in a range of about
5.0% to about 40.0% by weight of the composition,
and

the soya lecithin being in a range of about
0.04% to about 4.0% by weight of the composition.

25. The liquid composition of claim 20,
the polyvinyl alcohol being in a range of about
7.0% to about 12.0% by weight of the composition,
and

the soya lecithin being in a range of about
0.3% to about 0.5% by weight of the composition.

26. The liquid composition of claim 21,
the flow aid being in a range of greater than
0.0% to about 16.0% by weight of the composition.

5 27. The liquid composition of claim 21,
the flow aid being in a range of about
3.0% to about 5.0% by weight of the composition.

28. The liquid composition of claim 21,
the flow aid being talc, fumed silica, lactose,
or starch.

10 29. The liquid composition of claim 22,
the colorant being in a range of greater than
0.0% to about 24.0% by weight of the composition.

15 30. The liquid composition of claim 22,
the colorant being in a range of about 4.8% to
about 8.0% by weight of the composition.

31. The liquid composition of claim 22,
the colorant any food approved colors,
opacifiers or dyes.

32. The liquid composition of claim 23,
the viscosity modifier being in a range of
greater than 0.0% to about 0.8% by weight of the
composition.

5 33. The liquid composition of claim 23,
the viscosity modifier being in a range of
about 0.07% to about 0.12% by weight of the
composition.

10 34. The liquid composition of claim 23,
the viscosity modifier being xanthan gum,
hydroxypropyl-methylcellulose, alginates,
hydroxypropyl cellulose, natural gums,
carboxymethylcellulose, or combinations thereof.

15 35. The liquid composition of claim 20,
the water being in a range of about 60.0% to
about 95.0% by weight of the composition.

36. The liquid composition of claim 20,
the water being in a range of about 75.0% to
about 85.0% by weight of the composition.

20 37. A pharmaceutical tablet or the like coated
with a moisture barrier film coating made using the

coating composition according to any of the claims
1-17.

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38. A pharmaceutical tablet or the like coated
with a moisture barrier film coating made using the
liquid moisture barrier coating composition
according to any of the claims 19-36.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/08690

A. CLASSIFICATION OF SUBJECT MATTER		
IPC(6) :Please See Extra Sheet.		
US CL :Please See Extra Sheet.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
U.S. : 524/25, 28, 43, 45, 47, 55, 56, 451, 492; 424/474, 475, 476, 477, 480, 481		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
APS: moisture barrier coating, pharmaceutical tablet		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, A	US, A, 5,393,333 (TROUVE) 28 February 1995, see column 2, line 23 through column 4, line 11.	1-38
P, A	US, A, 5,411,746 (SIGNORINO) 02 May 1995, see column 3, line 35 through column 4, line 64.	1-38
A	US, A, 4,341,563 (KURIHARA) 27 July 1982, see column 2, line 35 through column 4, line 60.	1-38
A	US, A, 5,206,030 (WHEATLEY) 27 April 1993, see column 1, line 66 through column 2, line 37 and column 3, lines 3-53.	1-38
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art *A* document member of the same patent family	
A document defining the general state of the art which is not considered to be part of particular relevance		
E earlier document published on or after the international filing date		
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		
O document referring to an oral disclosure, use, exhibition or other means		
P document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search		Date of mailing of the international search report
05 SEPTEMBER 1995		01 NOV 1995
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231		Authorized officer <i>Renée Leavel</i> Lavonda DeWitt
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US95/08690

A. CLASSIFICATION OF SUBJECT MATTER:

IPC (6):

C08L 89/00, 5/04, 1/26; C08K 5/15, 3/34; A61K 9/28, 9/30, 9/42 9/34, 9/36

A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

524/25, 28, 43, 45, 47, 55, 56, 451, 492; 424/474, 475, 476, 477, 480, 481